
First name and last name

Fill out with capital letters

Student number

Writing time: 75 minutes, date: December 20, 2022

Comments: in case of all programs assume that libraries `iostream` and `stdlib` are attached and the namespace `std` is available. Only places marked for the answers are graded. In case you find a mistake or ambiguity in a question, write an appropriate comment which explains that. The number of marks for the test is 0-100 points (passing threshold = 50%).

Question 1. (20 pts. = 2*10 pts.)

Fill out the selected fields so that the depicted calls to the function `f` return the given values:

`f(2) = 3`

`f(4) = 5`

`f(9) = 10`

```
int f( int x ) {  
    if (      x>1      )  
        return x + f(      1      );  
    else  
        return x;  
}
```

Note: in case of multiple correct answers give the one with minimum number of characters (shortest one).

Question 2. (21 pts. = 3*7 pts.)

Give the text that is written to the screen as a result of executing the subsequent instructions `cout` (in place for an answer marked with label "Instruction x:" write the text that is printed to the screen by instruction `cout` marked with comment `/* I-x */`. Write `ERR` if the answer cannot be uniquely determined.

```
typedef struct {  
    int x, y, *ptr;  
} type_t;  
void f( type_t *p ) {  
    p->ptr = &(p->y);  
    p->y = 5; }  
void g( type_t p ) {  
    p.ptr = &(p.x);  
    p.x = p.y = 3; }  
  
int main() {  
    type_t p;  
    g( p );  
    f( &p );  
    cout << p.x; /* I-1 */  
    cout << p.y; /* I-2 */  
    cout << *(p.ptr); /* I-3 */  
    return 0;  
}
```

Answers:

Instruction 1: **ERR**

Instruction 2: **5**

Instruction 3: **5**

Question 3. (20 pts. = 4*5 pts.)

Fill out the selected fields so that the function returns the value of the field `hash` in the last structure in the table `b` whose field `key` equals `x`. The function returns -1 if the table `b` has no structure whose field `key` equals `x`.

```
typedef struct {  
    int key;  
    int hash;  
} pairs_t;  
  
int find( pairs_t b      ERR      , int n, int x ) {  
    while (      ERR      >= 0 )  
        if ( (b+n      ERR      key ==      ERR      )  
            return n;  
    return -1;  
}
```

Note: in case of multiple correct answers give the one with minimum number of characters (shortest one). Write in all fields `ERR` if the program cannot do what instructed.

Question 4. (20 pts. = 5*4 pts.)

Give the text that is written to the screen as a result of executing the subsequent instructions *cout* (in place for an answer marked with label "Instruction x:" write the text that is printed to the screen by instruction *cout* marked with comment */* I-x */*. Write *ERR* if the answer cannot be uniquely determined. Binary encoding of numbers is assumed, as presented during the lectures, i.e., U2. If some instruction results in an execution error, then also write *ERR* as an answer and continue your analysis by skipping this instruction.

```
int main() {
    int t[] = {1,2,3,4};
    int a=5, *x = &(t[1]);

    cout << (a<<2) + (--a); /* I-1 */
    cout << t + (*x)--; /* I-2 */
    if ( *t - *(t+1) || a-- )
        a--;
    cout << a; /* I-3 */
    cout << (7^12); /* I-4 */
    cout << sizeof t; /* I-5 */
    return 0;
}
```

Answers:

Instruction 1:	ERR
Instruction 2:	ERR
Instruction 3:	2
Instruction 4:	11
Instruction 5:	ERR

Question 5. (19 pts.)

What the following program will write to the screen? Write *ERR* if the answer cannot be uniquely determined, or the program has compilation or execution errors.

```
char s[128] = { "WeLikeLanguageC" };
int move( char *t, int i ) {
    int j;
    for ( j=i; j < i+5; j++ )
        if ( t[j] == '\0' )
            return i;
    return i + 3 - (i%2);
}
```

Answer: **ieaa**

```
int main() {
    int i=0, k;

    do {
        k = i;
        i = move( s+i, i );
        cout << *(s+i);
    } while ( i != k );
    return 0;
}
```
